What is effective instruction?

Does "how" we teach make a difference?

RESEARCH SAYS...

- The most important factor affecting student learning is the teacher;
- There is widespread variation in effectiveness of teachers;
- Effective teachers are effective with students at ALL achievement levels.

The average student who attends a "good instruction" school will have a score that is 23 percentile points higher than the average student who attends a "poor instruction" school. (Hunter & Schmidt, 1990)

Engaging learners with...

Brain-Compatible

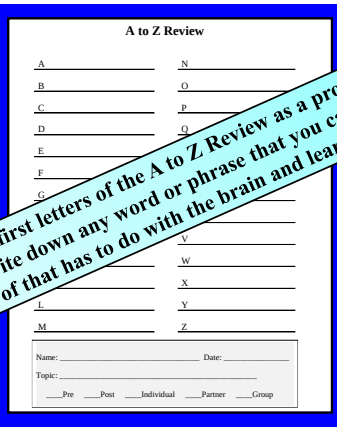
Lesson Design

Strong Lesson	Weak Lesson

T-Chart: Working with a partner, under each flap write three to five things an observer might see on a visit to one of these classrooms.

Brain-compatible **lesson design** will provide answers to questions:

- How do I differentiate lessons?
- How do I keep students engaged?
- How do I get them to remember what I've taught?
- How can I get them to be more reflective thinkers?
- How can I get my squirrelly students to pay attention?



Use the first letters of the A to Z Review as a prompt and write down any word or phrase that you can think of that has to do with the brain and learning.

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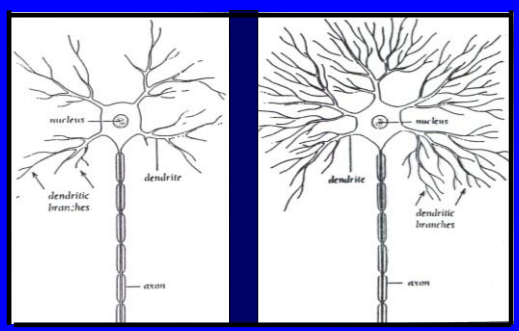
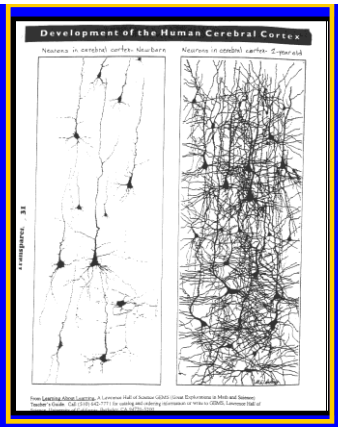
Adjusting *HOW* we teach is essential to reach all learners.

Environment Changes the Brain

Enriched environments
- increased cell weight
- increased branching of dendrites
- more synapses

Impoverished environments
- decrease in cell weight,
- possible loss of cells,
- diminished synapses





Neurons that fire together, wire together

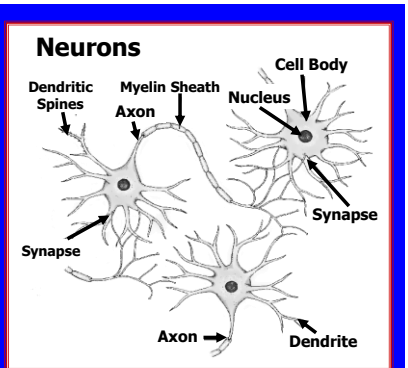
LTP Long Term Potentiation— the process of connections in the brain becoming more permanent (learning.)

The more permanent the connection, the greater the mylineation.

The second time a synapse fires, it takes less neurotransmitter (and so on…)

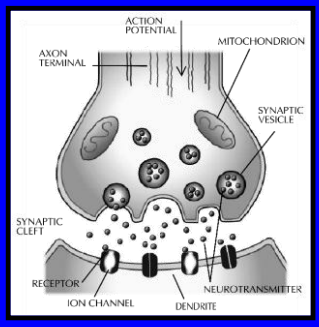
Our brains mylinate from back to front and inside to outside (according to how we survive.)

The brain is composed of over 100 billion brain cells (neurons) which communicate at junctures called synapses.



Neurotransmitters

Different neurons use one or more of the different neurotransmitters to send their message. Some neurotransmitters are excitatory and enhance the likelihood that a neuron will stimulate another to "fire." Others are inhibitory and lessen the likelihood of "firing."



BDNF—Brain-Derived Neurotrophic Factor

While neurotransmitters carry out signaling, neurotrophins such as BDNF build and maintain cell circuitry—the infrastructure itself.

BDNF enhances growth of dendritic branches— in turn solidifying connections of more synapses.

THERE'S MORE

BDNF improves the function of neurons, encourages growth, and strengthens and protects them against the natural process of cell death.

BDNF is an essential link between thought, emotions, and movement—particularly seeming to be important for long-term memories. Ratey, 2008

Brain activity is most enhanced ***after*** running and other strenuous exercise because physical exercise invigorates existing brain cells and stimulates the growth of new ones especially in the hippocampus, the brain area critical to learning and memory formation.

(Jensen, 2000 citing Hogervorst, E; Reidel; Jeukendrup, Jolles, 1996)

Exercise improves learning on Three levels:

- Optimizing your mind-set to improve alertness, attention, and motivation — **Attention**
- Preparing and encouraging nerve cells to bind to one another, which is the cellular basis for logging in new information — **Learning**
- Spurring the development of new neurons from stem cells in the hippocampus. Ratey, 2008 — **Boosting Recall**

The very last part of the brain to be pruned …is the prefrontal cortex, home of the so-called executive functions —*planning, setting priorities, organizing thoughts, suppressing impulses, weighing the consequences of one's actions.*

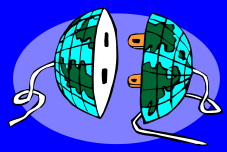
Discover Magazine
May 2004

Mirror Neurons

Neural connections are made via *mirror neurons* when students observe others:

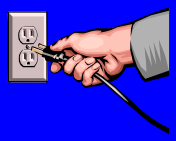
- Modeling a think-aloud
- Outlining procedures to follow
- Interacting with others (empathy)

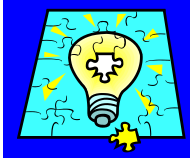
Meaning (connections)



No connections….no Meaning

The brain is continuously trying to make sense out of the world, attempting to determine what is meaningful in what it experiences.



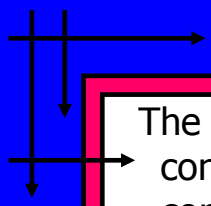


Every encounter with something new requires the brain to fit the new information into an existing memory category, or network of neurons.

If it can't, the information will have no meaning.

Effective instruction requires teachers to…

- **Find the experiences students have had and hook new learning to them or…**
- **Create the experiences with students**



The importance of connecting new content to prior knowledge cannot be over-emphasized!!!!!

Ways to tap into prior knowledge

- KWL
- A to Z Review
- Brainstorming
- Clustering
- Advanced Organizers

KWL(KEL)

Know	Expect to Learn	Learned

A to Z Review

A	N
B	O
C	P
D	Q
E	R
F	S
G	T
H	U
I	V
J	W
K	X
L	Y
M	Z

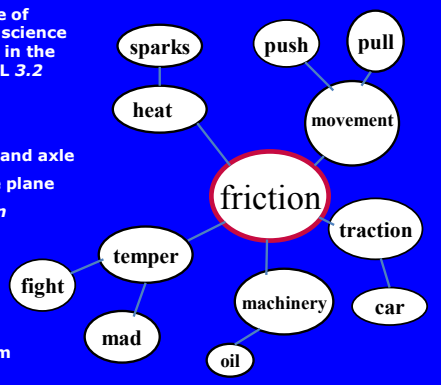
Name: _____ Date: _____

Topic: _____

___Pre ___Post ___Individual ___Partner ___Group

An example of *clustering* science vocabulary in the Science SOL *3.2*

- Lever
- Pulley
- Wheel and axle
- Incline plane
- *Friction*
- Screw
- Wedge
- Mass
- Force
- Fulcrum



Advanced Organizers!!!

Read the statements below and identify whether you *think* they are true or false.

		After
_____	1. We remember facts better when teachers lecture about key content.	1.___
_____	2. Dendrites grow all our lives.	2.___
_____	3. A chemical change occurs in our brain when we listen to music or sing.	3.___
_____	4. Teachers usually "tap prior knowledge" of students before beginning a lesson.	4.___
_____	5. Most of the questions teachers ask can be categorized as "higher level."	5.___
_____	6. Persistent stress affects students' attitudes, but not their ability to learn new information.	6.___

What happens first *(activating prior knowledge)* and what happens last *(closure)* help students *make meaning* out of what is taught

Primacy/Recency Effect

Research indicates that we remember what happens first and last and tend to loose what happens in the middle.

Action

So what should teachers do?

Reduce the amount of time in the middle by designing lessons in shorter "chunks."

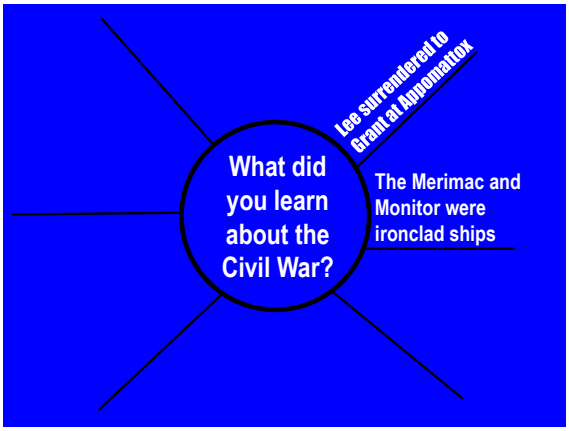
Summarize today's lesson with a content Cinquain

3,2,1: Write three things you learned today; write 2 connections to your real life; write 1 question for tomorrow.

Using pictures only, summarize three key points of today's lesson.

Create a web of (#) key terms that were discussed in class today.

Complete the "L" (Learned) in the KWL as your exit ticket.



Poetry can be used to develop memory, high-level thinking, and synthesize content.

Science Cinquains

Volcanoes
Red hot
Erupting, spuming, flowing
Caldron of molten rock
Lava

Photosynthesis
Light, energy
Transporting, storing, turning
Carbon dioxide into sugars
Chlorophyll

...and in Math

Variables
Substitute unknown
Replacing, solving, expressing
What we don't know
Terms

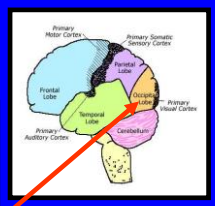
Equation
Always balances
Solving, equaling, operating
Both sides treated fairly
Solution

A Cinquain Break

Occipital Lobe (Visual Cortex

Speaking of Novelty…

Visual Memory Cues Help Make Connections



We remember pictures before text!

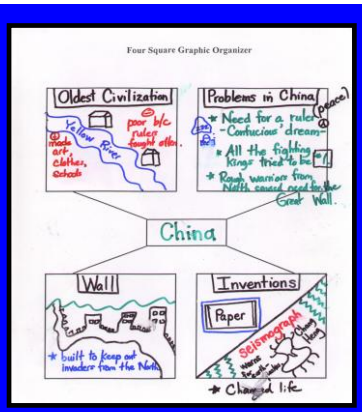
Donald Olson, an astrophysicist at Texas State University solves puzzles in literature, history and art using the tools of astronomy: charts, almanacs, and computers to map ancient skies

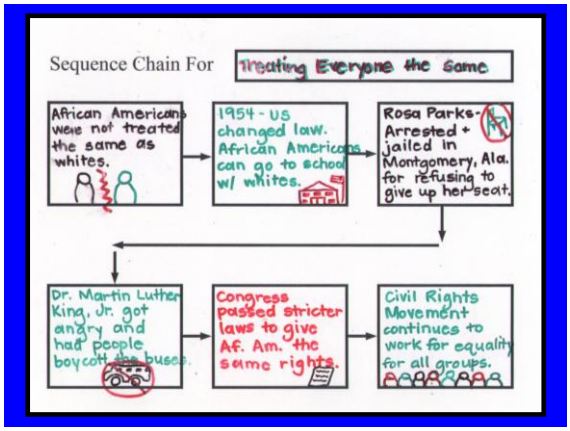
"Olson has tackled three van Gogh paintings, including *White House at Night*, one of more than 70 that van Gogh created in Auvers-sur-Oise in the weeks before he committed suicide, on July 29, 1890. When Olson and several of his students traveled to the town, about 20 miles outside Paris, they discovered that the house identified in most guidebooks as the one in the painting didn't have the right number of windows and faced the wrong direction. Once they found the right house—after walking every street in town—it was relatively easy to deduce from celestial calculations and weather reports that the star in the *White House* painting was actually the planet Venus as it appeared above the house near sunset on June 16, 1890."

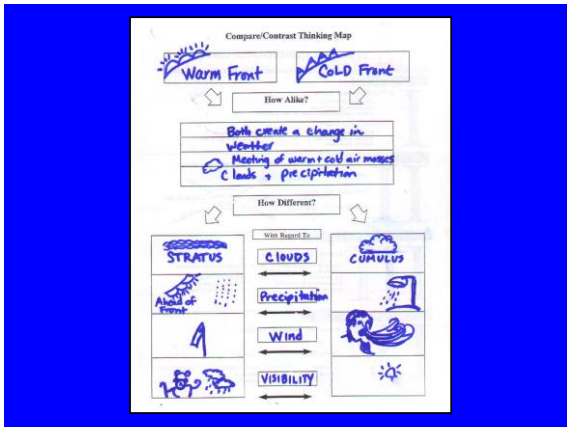
Source: Celestial Sleuth, Smithsonian Magazine, April 2009, 71-75

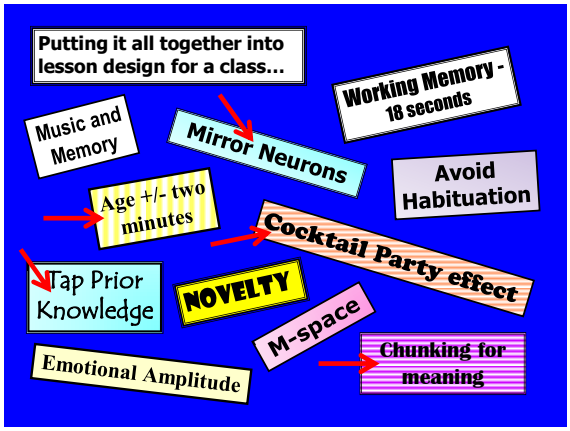
Graphic Organizers tap into the spatial part of the brain.

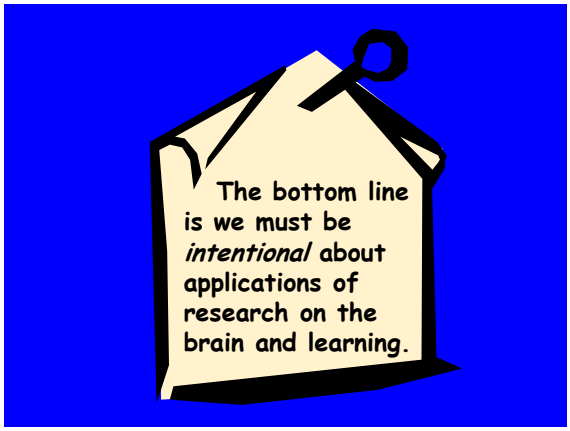
Pgs. 36-41




Sequence Chain For
Treating Everyone the Same
African Americans were not treated the same as whites.
1954 - US changed law. African Americans can go to school w/ whites.
Rosa Parks- Arrested + jailed in Montgomery, Ala. for refusing to give up her seat.
Dr. Martin Luther King, Jr. got angry and had people boycott the buses.
Congress passed stricter laws to give Af. Am. the same rights.
Civil Rights Movement continues to work for equality for all groups.


Compare/Contrast Thinking Map
Warm Front
COLD Front
How Alike?
Both create a change in Weather
Meeting of warm + cold air masses
Clouds + precipitation
How Different?
With Regard To
STRATUS
CLOUDS
CUMULUS
Ahead of Front
Precipitation
Wind
VISIBILITY


Putting it all together into lesson design for a class...
Music and Memory
Mirror Neurons
Working Memory - 18 seconds
Avoid Habituation
Age +/- two minutes
Cocktail Party effect
Tap Prior Knowledge
NOVELTY
M-space
Emotional Amplitude
Chunking for meaning


The bottom line is we must be *intentional* about applications of research on the brain and learning.